



REUSE IN SOFTWARE ENGINEERING

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C.E.S.A.R, RiSE and RiSE Labs – Bringing Innovation, Quality, and Experience in Software Reuse for Companies

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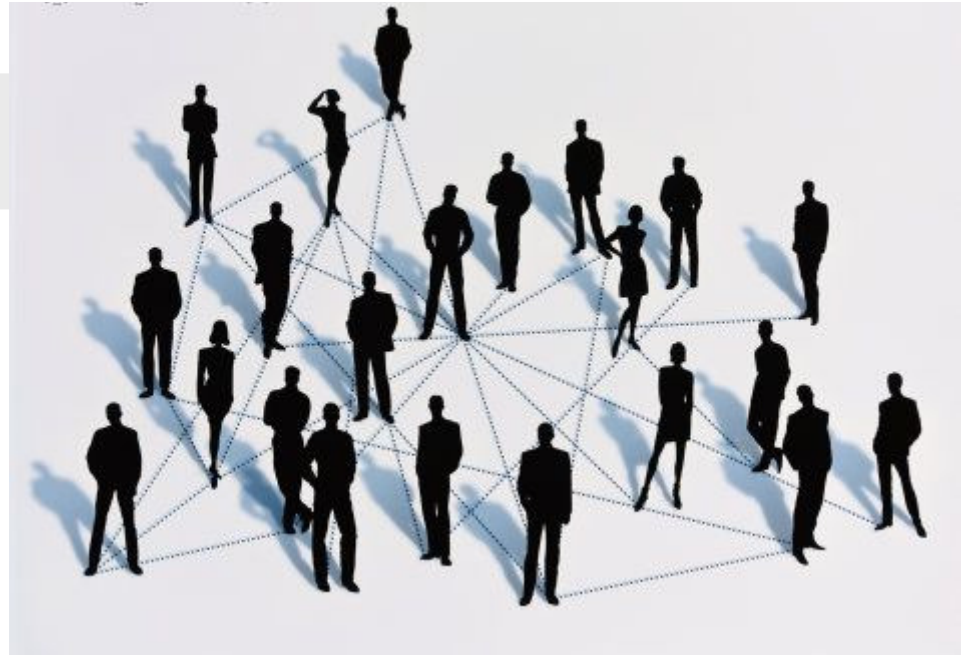


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IT Market Reality

- Growing Market
- Lack of Good Professionals
- Need to improve productivity
- Need to reduce costs



IT Market Reality



The Redevelopment Hypothesis

Most software development is mostly redevelopment

David Weiss

Research Director, Avaya Labs

A Better approach

- Optimize processes
- Use better tools
- (Re)Use what you have



[Boehm, 1999]

**We can improve productivity with the
resources we already have**

Building without Reuse (Personalization)



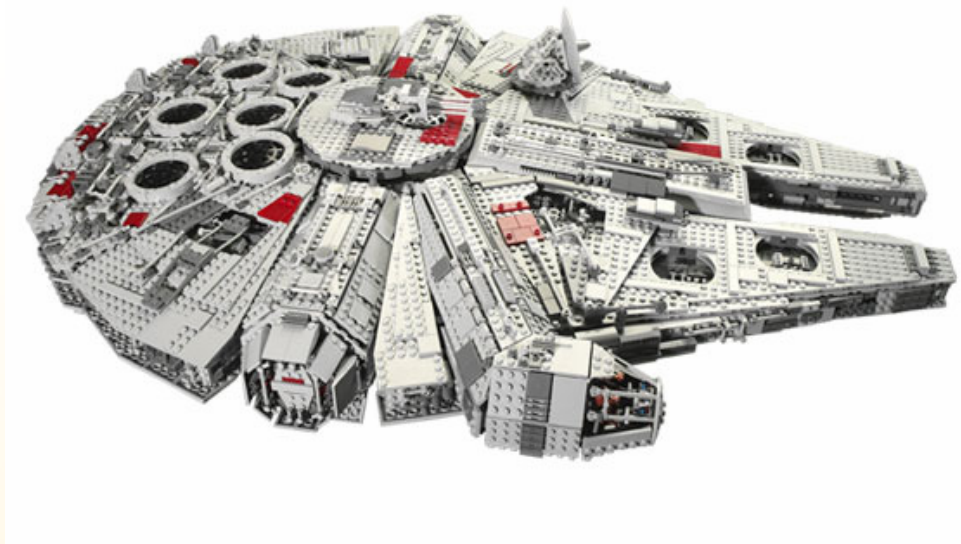
Who: Nathan Sawaya (Artist)

What: Art pieces

How Long: Months to build one piece

How Much: Thousands of dollars a piece

Building with Reuse (Modularization)



Who: Lego (Manufacturer)

What: 5.000 pieces Starship with manual

How Long: Hours to build

How Much: US\$ 500

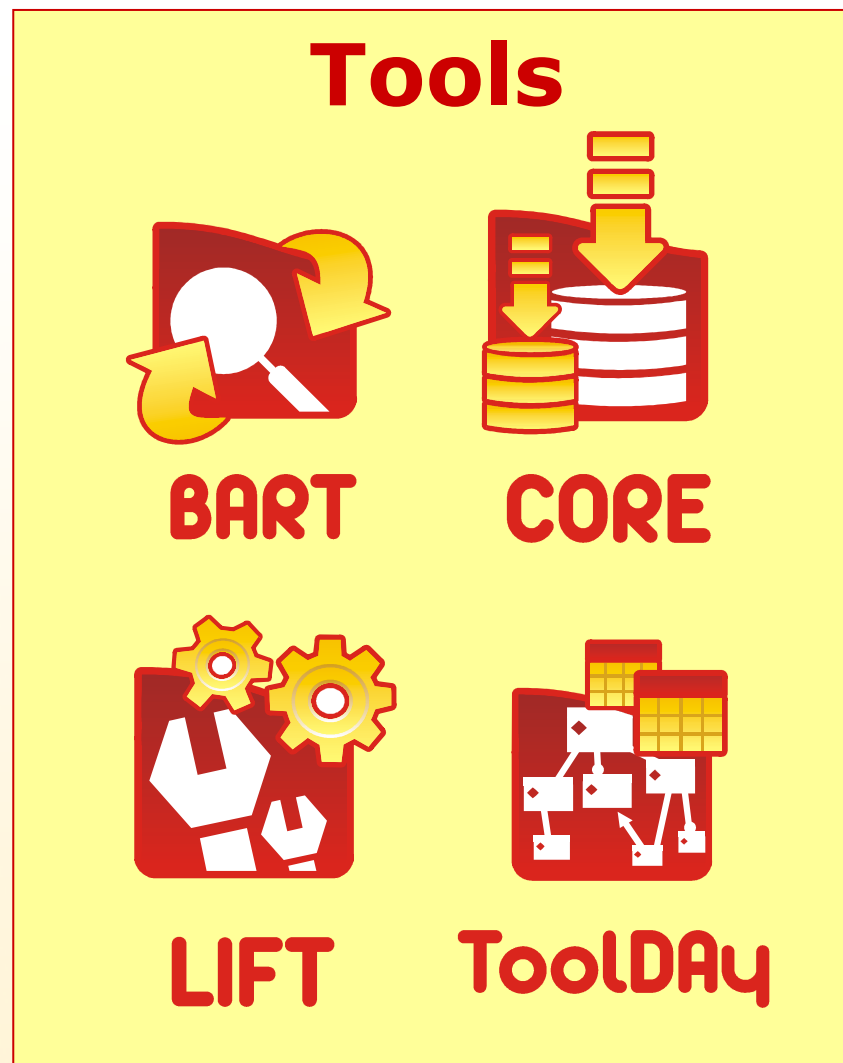
Optimize the development process

Benefits of Software Reuse

- 1 – Improve Productivity
- 2 – Reduce Costs
- 3 – Improve Quality

Who are we?
What do we do?

RiSE Full Service Portfolio



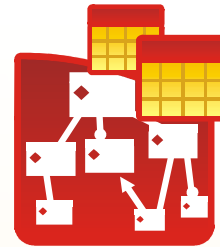
RiSE Tools – Step By Step



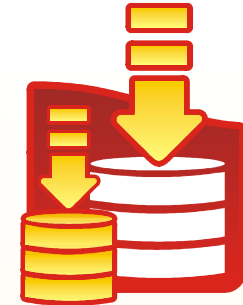
BART



LIFT



ToolDAY



CORE



Basic Asset Retrieval Tool



- Search Assets
 - Code
 - Documents
- IDE Integration
- Security
- Folksonomy
- Fast Results
- Up to Half a Million Assets
- Coming Soon
 - Integration with Asset Repository
 - Proactive Approach
 - Search Open Source Code
 - Java.net
 - Sourceforge
 - Eclipse

Component Repository



CORE



- Manage Asset
- Asset Certification
- Update Notification
- Security
- Bug Tracking
- Management Reports
- Asset Metrics
- IDE Integration (RAS Packager)
- New:
 - www.enterprise-components.com
 - Open Source Components

Tool for Domain Analysis



- Deal with Multiple Systems
- Plan for Reuse
- Reuse and Business/Strategic Guidelines
- Coming Soon:
 - Integration with Search Engine
 - Integration with Asset Repository



Legacy Information Retrieval Tool



LIFT

- Understand Legacy Systems
- Visual Representation of Complex Systems
- Extract Business Rules
- Document Legacy Systems
- Reports and Metrics
- Up to Half a Million Lines of Code
- Coming Soon:
 - Integration with Search Engine

The Team



RiSE Team (Ph.D. and Masters) and
International Reuse Specialists from
US, Germany and Sweden

COMPGOV – Top 10

Funded Government Project



Intel Venture Capital + UC Berkeley

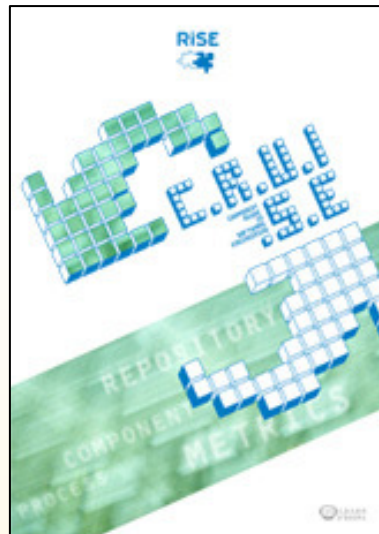
RiSE Business Plan – Top 10



RiSE Book Authors

Education and Culture

<http://cruise.rise.com.br>



<http://worldofreuse.blogspot.com/>



<http://riss.rise.com.br/>

National Customers/Partners



Cases

- **Research**

- Worked in the main software reuse research projects financed by the Brazilian government
- TOP 10 Award

- **Education**

- Petrobras: Corporate software reuse workshop with IT team from different states in Brazil
- C.E.S.A.R EDU: M.Sc. Courses in Software Reuse

- **Consulting**

- CENSIPAM: Software reuse consultancy in **one of the biggest mission-critical systems in Brazil**. CENSIPAM (Centro Gestor e Operacional do Sistema de Proteção da Amazônia)

Cases

- **Reuse Adoption Program**
 - CPM: Development of a Reuse Environment and process
 - AMIGOS: Social Network domain, increasing the reuse capability towards a SPL approach
- **Tools**
 - Pitang: Software reuse tools introduction
 - CESAR.EDU: Software reuse tools to aid in the MPES course lectures and projects
 - CESAR: Software reuse tools introduction and process adaptation
- **Results**
 - Up to 60% in software development improvement
 - Better understanding and implementation of software reuse process
 - Software development effort reduction

Opportunities

- **Education**
 - Technical workshops to promote software reuse culture
- **Software Reuse Consulting**
 - Identify software reuse opportunities according to organization needs and goals
 - Define **HOW** to measure (technical and economical) software reuse in the reuse program
 - Define and Adapt software reuse processes
- **Software Tools**
 - Implement and promote software tools to improve productivity



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Roots

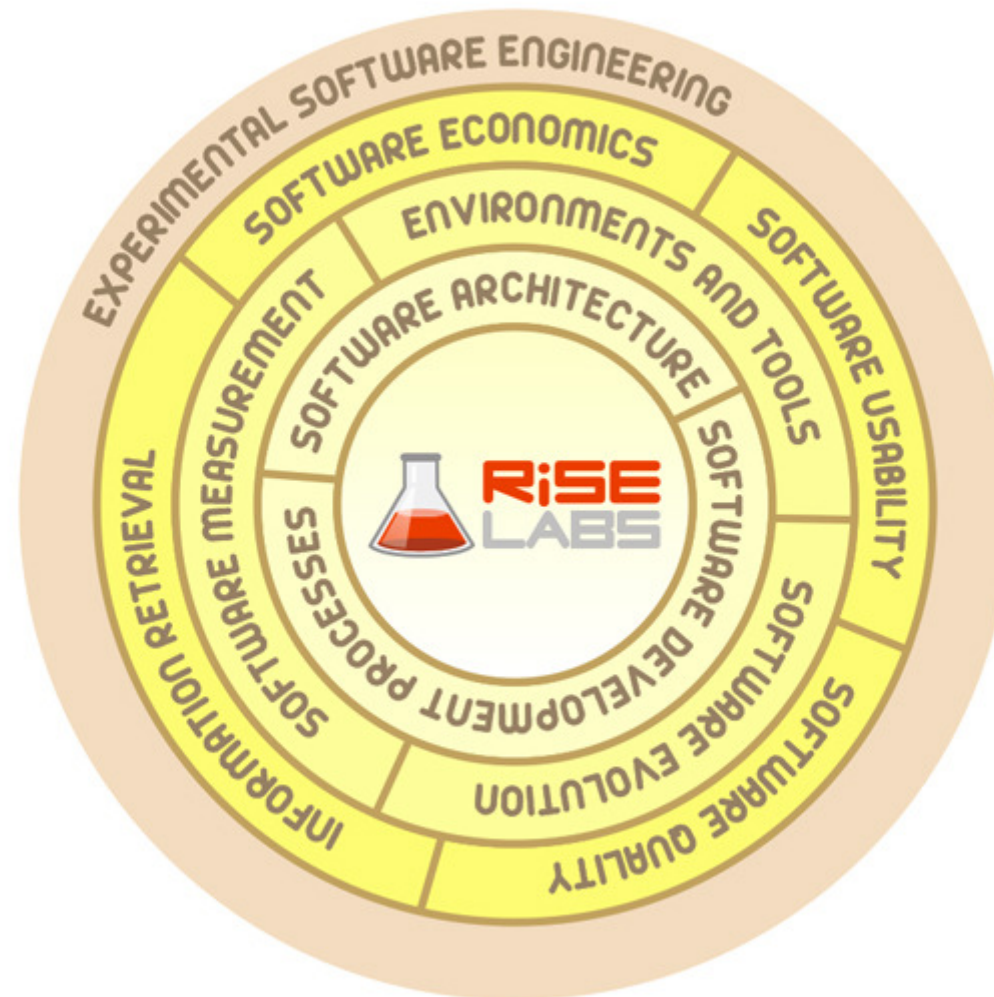


- RiSE unit for Research
- More focus on RiSE efforts
- Self sustainable
- Research based on:
 - **RiSE's problems**
 - **State-of-the-art**
 - exploratory research

INITIAL GOAL

RiSE Labs goal is to bring **excellence** in research for customers based on **industrial needs** and the **state-of-the-art** in the software productivity area

INFLUENCES



TEAM

- Researchers (Ph.D.s), Ph.D. and M.Sc. students



PARTNERS



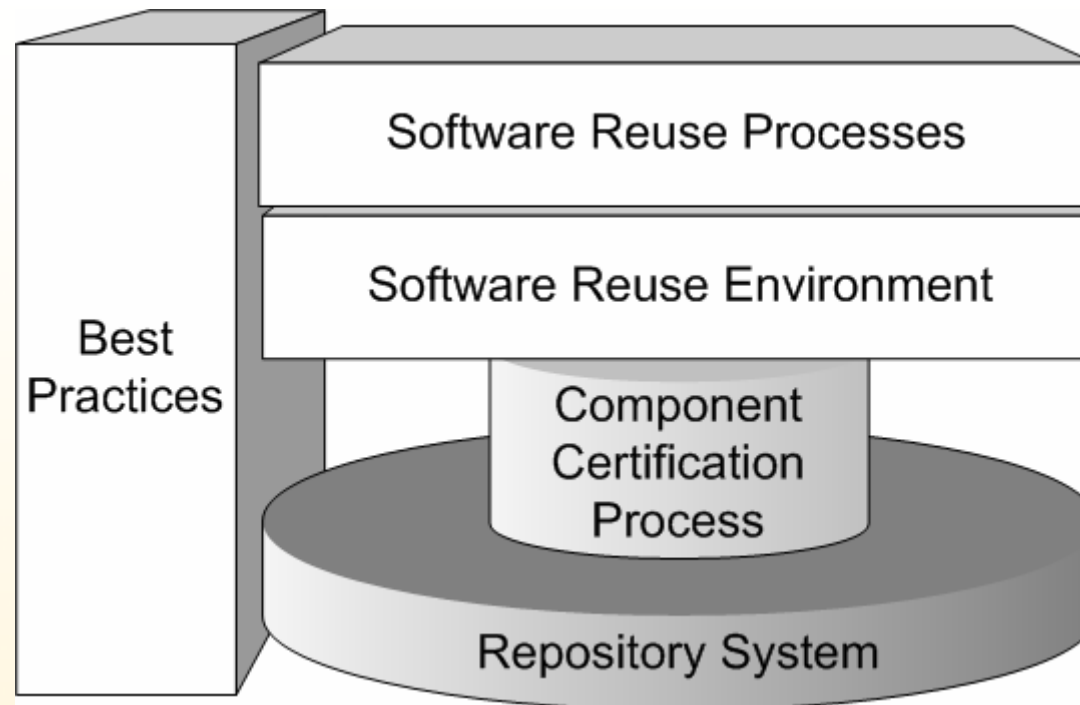
PARTNERS – cont.



Microsoft®
Research



PREVIOUS EFFORT



RiSE Framework

Almeida, E, S.; Alvaro, A.; Lucrédio, D.; Garcia, V, C.; Meira, S, R, L. **RiSE Project: Towards a Robust Framework for Software Reuse.** In the IEEE International Conference on Information Reuse and Integration (IRI), Las Vegas, Nevada, USA, 2004.

CURRENT PROJECTS | DIRECTIONS

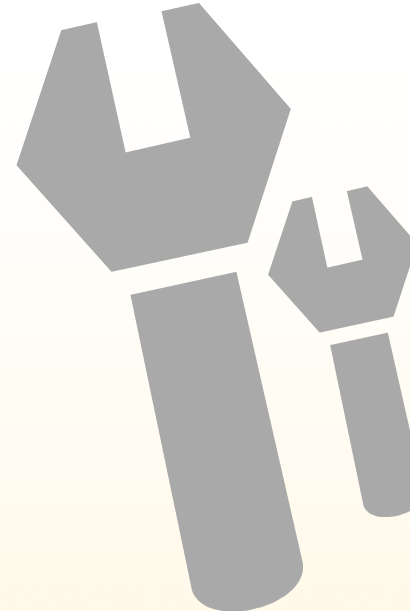


CURRENT PROJECTS | DIRECTIONS

- **RiSE Framework Project (to be concluded)**
- **Processes**
 - Domain Engineering based on CBD
 - Domain Engineering based on Models
 - Process Adaptation
 - Component Certification
 - Component Testing
 - Reuse Introduction in Companies
- **Tools**
 - LiFT
 - ToolDAY
 - LiFT
 - CORE
 - B.A.R.T, ADMIRE
 - DoFAST
 - PUG
- **Models**
 - Economic Model for Product Lines

CURRENT PROJECTS | DIRECTIONS

- **RiSE Tools Project**
- **B.A.R.T**
 - Models
 - Services
- **LiFT**
 - Clone Detection
 - Models

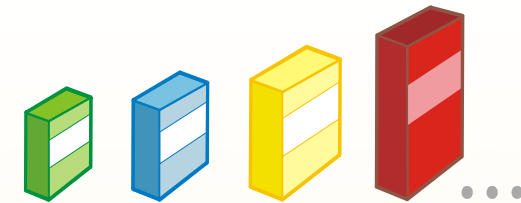


CURRENT PROJECTS | DIRECTIONS

- **RiPLE – RiSE Process for Product Line Engineering**

- **Research Areas**

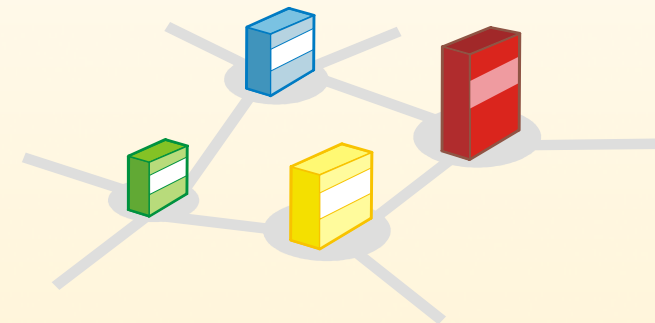
- Requirements Engineering
- Design
- Testing
- Evolution
- Product Derivation



- **SOPLE – Service-Oriented Product Line Engineering**

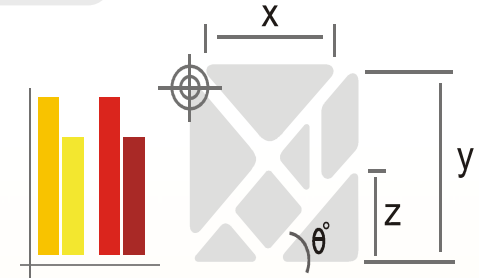
- **Research Areas**

- Scope Definition
- Feature Interaction
- Requirements Engineering
- Design
- Implementation
- Testing
- Evolution
- Product Derivation

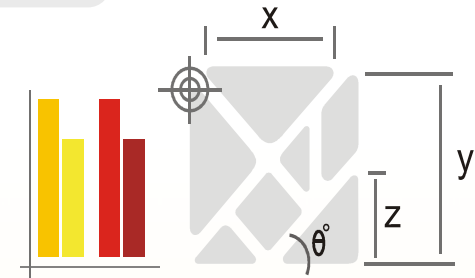


CURRENT PROJECTS | DIRECTIONS

- **MATRIX Project**
- Steps:
 1. **Empirical Study based on Expert Opinion to characterize**
 - What measures are being actually used in the practice?
 - Life cycle, SPL, Repositories
 - What the most common types of measures used by practitioners?
 - Are the measures relevant to industrial needs?
 - What is the gap between researchers and practitioners?
 - What is the perceived value of reuse measurement?



MATRIX PROJECT

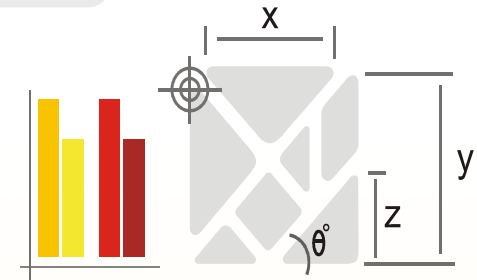


2. Empirical Study on Software Reuse Metrics

- Understand and Characterize Software Reuse Metrics in software development projects and software product line projects
- Understand and Characterize relationships among the metrics
- Identify how was the relationships with other issues (quality, productivity, costs, maintenance) in the projects
- Reinforce previous studies
- Identify trends for new metrics
- Using [possibility]:
 - Software Metrics/Reuse Similar Studies
 - Properties
 - Software Metrics Good Practices
 - Defined Processes

MATRIX PROJECT

- 3. Software Reuse Measurement Kit
 - Based on findings of studies 1 and 2
 - Define tools, templates, training
- 4. Experimental Study with Software Reuse Measurement in Small Organizations
 - Understand and Characterize the effects of the measurement
 - Based on the previous Kit
 - Reinforce findings from activity 1



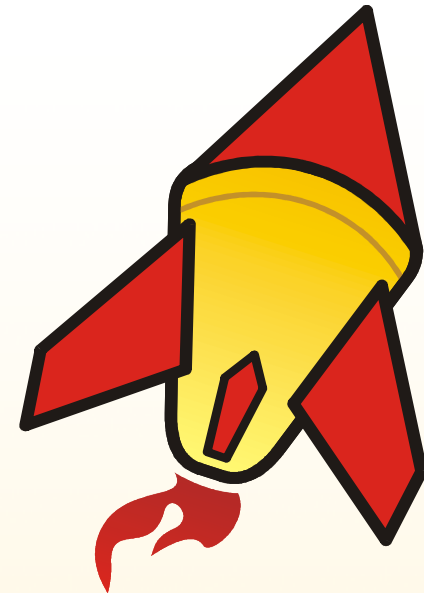
CURRENT PROJECTS | DIRECTIONS

- **BTT Project – Bug Triage Tool**
- **Duplicate CR Problem**
- **Research Areas**
 - Text Mining
 - Software Visualization techniques
 - Topic Detection and Tracking (TDT)
 - Software Usability
 - Empirical Studies



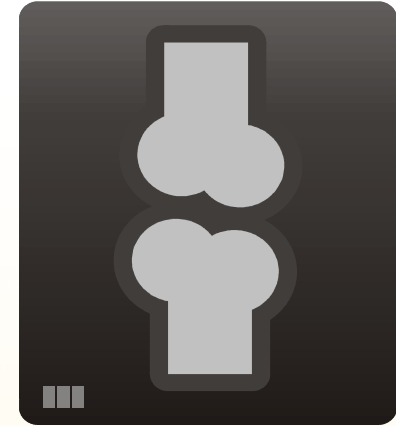
CURRENT PROJECTS | DIRECTIONS

- **Exploratory Research**
- **Research Areas**
 - Agile Product Lines
 - Dynamic Product Lines
 - Generative Product Lines
 - Model-Driven Product Lines
 - Risk Management in Product Lines
 - Ultra-Large Scale Systems
 - Processes
 - TSP
 - PSP



CURRENT PROJECTS | DIRECTIONS

- **CX-Ray**
- **Understand C.E.S.A.R efforts empirically**
- **Experimental studies**
 - Requirements
 - Design
 - Implementation
 - Testing
 - Evolution
- **Applications**
 - Social networks



RESULTS



ERROR: stackunderflow
OFFENDING COMMAND: ~
STACK: